

CLAIMS

1. A sorbent suitable for use as a stationary phase in elution chromatography, the core of said sorbent consisting of an organic resin and said sorbent having a plurality of covalently bonded non-aromatic zwitterionic groups on its surface.
2. A sorbent according to claim 1, characterised in that the sorbent comprises a porous carrier.
3. A sorbent according to claim 1 or claim 2, characterised in that the zwitterionic non-aromatic groups have been bound to the carrier by polymerising, preferably graft polymerising, monomers comprising non-aromatic zwitterionic groups on the surface of the carrier.
4. A sorbent according to claim 3, characterised in that the zwitterionic non-aromatic groups have been incorporated throughout the structure of the carrier sorbent by polymerising monomers comprising non-aromatic zwitterionic groups together with suitable divinyl crosslinking monomers.
5. A sorbent according to claim 1 or claim 2, characterised in that the zwitterionic non-aromatic groups have been bound to the carrier by activation of the carrier with an alkylating functional group, which is subsequently reacted with an ω -dialkylaminoalkylsulfonic acid to form non-aromatic zwitterionic groups on the carrier.
6. A sorbent carrier according to claim 1 or claim 2, characterised in that the surface of the organic resin has been activated by incorporation of a reactive functional group such as epoxy, or halogenoalkyl, such as chloroalkyl or bromoalkyl and that is capable of alkylating the amino group of an

aminoalkylsulfonic acid in a reaction producing covalently bonded zwitterionic non-aromatic groups on the sorbent carrier.

- 5 7. A sorbent carrier according to claim 1 or claim 2, characterised in that the surface of the organic resin has been activated by incorporation of a reactive functional group such as hydroxyalkyl, carboxylic acid, carboxylic acid chloride, carboxylic acid bromide, carboxylic anhydride, carboxylic ester, alkyl oxonium, epoxy, chloroalkyl, bromoalkyl, diazoalkyl, or activated amide such as a carboxylic imidazolidine or triazolidine, that is capable of forming an ester or ether bond with a hydroxyl group residing on the alkyl chain interconnecting the quaternary ammonium group and the sulfonate group in a sulfobetaine zwitterion, thus covalently binding a non-aromatic zwitterionic group to the surface of the activated sorbent carrier in a lateral fashion.
- 10 8. A sorbent carrier according to any one of the previous claims, characterised in that the carrier is a polymeric monolith.
- 15 9. A sorbent carrier according to any one of the previous claims, characterised in that the zwitterionic groups are ω -sulfoalkyl-trialkylammonio (sulfobetaine) groups.
- 20 10. A method for purifying a particular biological macromolecule such as a protein or a nucleic acid by zwitterionic ion exchange chromatography, comprising the steps of
- 25 a) determining the approximate net charge of the biological macromolecule in aqueous solution as a function of pH of said solution;
- b) using the information obtained in step a) for choosing a pH and an ionic strength at which the macromolecule obtains a suitably strong interaction with a zwitterionic ion exchange column;

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- c) using the information obtained in step b) for choosing a pH and an ionic strength at which the macromolecule is eluted;
- d) applying a solution containing said biological macromolecule to a column comprising zwitterionic sorbent carriers, said solution having a pH and an ionic strength that have been chosen in step b);
- 5 e) eluting the column in step d) with an elution solution whose pH and ionic strength have been chosen in step c); and
- f) recovering said biological macromolecule.

10 11. A method according to claim 10, characterised in that the column contains sorbent carriers comprising zwitterionic non-aromatic groups according to anyone of claims 1-9.

15 12. A method according to claim 10 or claim 11, characterised in that the maximal ionic strength used is 0.25 M.

20 13. A method according to anyone of claims 10-12, characterised in that the solvent in the elution solution consists of water with less than 10% admixture of an organic solvent.

14. An ion exchange column suitable for use in zwitterionic ion exchange chromatography comprising a sorbent carrier according to anyone of claims 1-9.

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